Section 1
Introduction

1.1 Background

The Enhanced Traffic Management System (ETMS) is an operational system for assisting the FAA in the performance of air traffic management. Air traffic management is the strategic control of traffic flow; its purpose is to minimize delays and congestion and maximize the overall throughput of the National Airspace System (NAS). Air traffic management is performed by a three-level hierarchical organization:

(1) The Air Traffic Control System Command Center (ATCSCC) is the top level and manages nationwide traffic problems and coordinates and approves actions taken by the distributed traffic management facilities.

(2) The Traffic Management Units (TMUs) at the Air Route Traffic Control Centers (ARTCCs) is the middle level and manages traffic problems within the scope of the ARTCC.

(3) The TMUs at the Terminal Radar Control (TRACON) facilities is the bottom level and manages problems specific to the terminal(s) under their control.

Initially, the ETMS consisted of the software and hardware necessary to support the *Aircraft Situation Display* (*ASD*), a highly successful system for graphically displaying current aircraft positions on a national scale superimposed on maps of geographical boundaries and NAS facilities. Subsequently, the Monitor/Alert function was developed. Monitor/Alert allows traffic demands to be projected for all airports, sectors, and fixes of interest in the continental U.S. and automatically generates alerts when the projected demands exceed alert thresholds. Monitor/Alert data is made available to traffic management specialists through the next generation ASD, the *Traffic Situation Display* (*TSD)*.

The ETMS provides a mechanism for using functions from the Advanced Traffic Management System (ATMS) research and development effort for current traffic management operations, as these are deemed working and useful.

1.2 About This Document

The *ETMS System Design Document* describes the entire *ETMS* in enough detail that an experienced software developer can read the document and then gain an understanding of the source code, that is, it serves as a *guide* to the *ETMS* software code. The document uses a modular structure so that the description of each process includes background information,

input and output specifications, a processing description, and explanations of any special design features. In addition, the document contains detailed data structure breakdowns and configuration details.

1.2.1 Document Structure

The *ETMS System Design Document* is divided into two volumes, 11 parts, and 34 sections:

- Part I consists of Section 1, this introduction.
- Part II is a system overview; it includes Sections 2 through 5, which present a functional overview, a processing overview, system hardware and software description, and a design principles overview, respectively.
- Part III contains Section 6, a description of the weather data acquisition.
- Part IV contains Sections 7 and 8, which describe the external and internal communications functions, as well as external communications interfaces.
- Part V includes Sections 9 through 16, which describe the user functions.
- Part VI includes Sections 17 through 21, which describe the user support functions.
- Part VII contains Section 22, a description of the airline schedule data processing.
- Part VIII includes Sections 23 though 26, which describe the traffic model functions.
- Part IX consists of Section 27, which describes the traffic management functions.
- Part X includes Sections 28 through 33, which provide details on auxiliary support functions: how the various *static* data files and databases required by the ETMS is generated.
- Part XI consists of Section 34, which details the hardware and software run-time configurations.

Sections 7 through 34 contain the detailed processing descriptions. For the reader's convenience, each section contains a range of processing information, from introductory material to program logic diagrams, data flow charts, and source code references.

Readers should become familiar with Parts I and II first; thereafter, they should be able to skip to the section of the document which interests them most. In Part VIII, Section 23 should be read before Sections 24, 25, or 26 since it introduces some design concepts cited in the other three sections.

1.2.2 Conventions Used in This Document

- Terminology
    - The *ETMS System Design Document* uses the following terms in specifically defined ways to avoid ambiguity:
        - *Process* refers to a computer process – a single execution of a computer program.
        - *Function* refers to a computer process, or set of processes, which perform a particular job within the context of the ETMS.
        - *Routine* refers to a source code procedure.
        - *Module* refers to a set of routines which perform a particular job within the context of a process.
    - *Processes* and *routines* are always referred to by their actual names because they correspond to existing entities.
    - *Functions* and *modules* are assigned descriptive names throughout the document because they are conceptual entities.
- Font Styles
    - *Italic*–All routine names, module names, process names, function names, emphasized words, and document names appear in *italic* print. This does not apply to titles.
    - **Boldface**–All filenames, data item names, and data values appear in **bold** print.
- Repetition of Illustrations
    - Many illustrations appear within the text; they include some tables, which are also cited in the last sections (*Data Structures*) of the ETMS process sections. When a table is referenced both within the text and in the *Data Structures* section, it can appear twice in the same chapter.
- Data Structure Tables
    - Tables referring to the data structures of a process are found at the end of the process description. If there is only process, all the data structure tables are at end of the section. If there are many processes in a section, the data structure tables are at the end of each process description.
    - Data structure tables are supplied for pertinent data, and general references in the text are made to these tables.
- Subroutine Libraries and Subroutine Calls

- The *ETMS System Design Document* does not currently include lists of libraries and subroutines. There are standard software procedures (*Unix* and *Clearcase* commands) for obtaining these library lists.
- Subroutine calls can be found in the software code. Other subroutine information may be described in the processing sections.

1.3 Related Documents

The related ETMS documents are as follows:

- The *ETMS Functional Description*
- The *ETMS Software Installation Guide*
- The *ETMS System Administration Manual*
- The *ETMS Tutorial*
- The *ETMS Reference Manual*
- The *ETMS TSD Quick Reference Guide*

The technical documentation of the ETMS consists of this document and the *ETMS Functional Description*. The *ETMS Functional Description* describes what the ETMS does, without explaining how the system was designed or why certain principles were implemented. Readers unfamiliar with the ETMS are advised to read the *ETMS Functional Description* before reading this document.

Two maintenance documents help ETMS users install the software and respond to minor system problems as they arise:

- The *ETMS Software Installation Guide* explains how to load and initialize the ETMS software.
- The *ETMS System Administration Manual* provides some basic operating system information and a few step-by-step procedures to follow when problems occur.

Users gain access to the ETMS through the *Traffic Situation Display* (*TSD*) and other interface functions. Readers of this design document *should* familiarize themselves with the operation of the *TSD* and the other interfaces (and their data); they can consult the following:

- The *ETMS Tutorial* is a self-teaching document for *new* users of the system.
- The *ETMS Reference Manual* is a complete description of the *ETMS* user interface commands and features in a dictionary format for users *already familiar* with the system.

- The *ETMS TSD Quick Reference Guide* is a convenient reminder of the main commands.